Citation:

Berkey CS, Rockett HR, Gillman MW, Field AE, Colditz GA. Longitudinal study of skipping breakfast and weight change in adolescents. *Int J Obes Relat Metab Disord*. 2003 Oct;27(10):1258-66

PubMed ID: 14513075

Study Design:

Cohort study (longitudinal, prospective)

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

NEUTRAL: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

Using data from the Growing Up Today Study (GUTS), prospectively analyze the relationship between breakfast frequency and subsequent changes in body mass index (BMI).

Inclusion Criteria:

9-14 year old offspring of Nurses' Health Study II participants whose mother returned the consent form and who responded with a completed questionnaire.

Definition of weight reference: (CDC BMI standards) below 10^{th} percentile = lean, between 85^{th} and 95^{th} percentiles = at risk of overweight, above 95^{th} percentiles = overweight

Exclusion Criteria:

Any height that was more than 3 standard deviations (s.d.) beyond the gender-age-specific mean height and any 1 year height change that declined by more than 1 inch or increased by greater than 3 s.d.. Any BMI <12.0 kg/m^2 as a biological lower limit and any BMI greater than 3 s.d. above or below the gender-age-specific mean.

Description of Study Protocol:

Parental consent and youth questionnaires were mailed to participants. Longitudinal analyses were restricted to 8128 girls and 6458 boys who were of age 9-17 y upon returning two or more consecutive annual surveys, or 1996 and 1999 surveys.

Data Collection Summary:

Dependent Variables

- BMI (height and weight self-reported by children)

Independent Variables

- Breakfast frequency ("Breakfast" not defined. In 1996, 1997, and 1998, investigators asked "How many times each week (including weekdays and weekends) do you eat breakfast?" Response categories were never (or almost never) 1-2 times per week, 3-4 times per week, and five or more times per week.),
- Physical activity and hours of recreational inactivity
- Energy intake (FFQ)

Control Variables

- Race/ethnicity, Tanner maturation stage, menarche history, age (from birthdate and date of questionnaire), Harter Self-Perception Profile for Children regarding schoolwork.

Description of Actual Data Sample:

Initial N: 26,765

Attrition (final N): 14,586

Age: 9 to 14 years

Ethnicity: 94.7% White, 0.9% African American, 1.5% Hispanic, 1.5% Asian, 1.4% Other

Location: 50 US states

Duration: 3 years

Summary of Results:

Baseline: 23.3% boys and 17.4% girls were overweight; 7.2% boys and 8.6% girls were very lean. 26.4% boys and 25.3% who never ate breakfast were overweight than those who ate breakfast nearly every day (21.2% boys and 15.8% girls were overweight).

3-year BMI change (1996-1999): Normal weight girls who ate breakfast 1-2 days/week gained more weight than peers who ate daily (0.072 (0.037) kg/m^2 than peers who ate daily. Overweight boys and girls who skipped breakfast gained less weight than daily eaters (boys never-eaters: -0.425 (0.234) and 3-4 days/week: -0.139 (0.071); girls who ate 1-2 days/week: -0.114 (0.067) and 3-4 days/week: 0.177 (0.056)).

Self-reported academic performance 1 year later: Boys who never ate breakfast were less likely (RR=0.68; 95% CI: 0.53-0.89) to report a year later that they did well at their schoolwork. Girls who never ate breakfast were less likely (RR=0.73; 95% CI: 0.62-0.86) to report a year later that they did well at their schoolwork.

Author Conclusion:

Data suggests that children who skipped breakfast had lower energy intakes. However, normal weight children who never ate breakfast tended to gain weight. Overweight children who skip breakfast might lose weight, but alternative methods of reducing energy intake are preferred given the well-documented adverse effects of skipping breakfast on academic performance.

Reviewer Comments:

Strengths:

- *Longitudinal design to study changes over time in breakfast frequency and in BMI, while accounting for growth and maturation*

Limitations:

- *Uncontrolled residual and unmeasured confounding.*
- *Youth self-report questionnaires.*
- *No validation studies of change over time in youth self-reported BMI.*
- *Imprecise assessment of physical activity, inactivity, and energy intake; no attempt to estimate duration or intensity of physical activity; wide range of food portion sizes hinder accurate estimation or total energy intake.*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	N/A

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes

2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	N/A
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	N/A
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	N/A
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	Yes
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	???

5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	???
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	???
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	N/A
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	No
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	No
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes

	7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**		Yes
	8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
	8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
	8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
	8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
	8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
	8.6.	Was clinical significance as well as statistical significance reported?	Yes
	8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**		Yes
	9.1.	Is there a discussion of findings?	Yes
	9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**		Yes
	10.1.	Were sources of funding and investigators' affiliations described?	Yes
	10.2.	Was the study free from apparent conflict of interest?	Yes